Deutschland
Land der Ideen

CUTEC NEWS

New technology: DeSiFloc – Landfill leachate treatment

FACTS · INFORMATION · ANALYSES

No_3 www.cutec.de November 2007

Land of Ideas

Looking back on the open day at CUTEC on 9th July

The presentation of the award to Prof. Carlowitz (left: the Lower Saxon Minister for Science and Culture, Lutz Stratmann, right: Mr Eggert, Deutsche Bank)

It is certainly no exaggeration to call the weather of this summer changeable and unstable. On 9th July, we too had to content ourselves with weather that one would not expect on a summer's day - dark clouds from which rain fell repeatedly, and even torrentially in the late afternoon. Nevertheless, I started the open day almost punctually, shortly after nine o'clock, when an already considerable number of guests had assembled. Among the guests who clinked their glasses with the members of staff after the opening were several local notables. The morning of that Monday

Children and teenagers were curious about the lectures for pupils and participated in them with great enthusiasm

The CUTEC rally attracted old and young participants with super prizes

belonged to the invited school classes from the region. A rally through the CUTEC building and several lectures on current CUTEC projects were in store for the pupils, as well as other lectures that had been especially prepared for them. The young guests were accompanied and entertained by a magician, who inspired them not with scientific explanations but with conjuring tricks.

In the balloon contest, greetings were sent into the sky

Out of consideration for the schedule of the Lower Saxon Minister for Science and Culture, Mr Lutz Stratmann, the real festivities, with the award ceremony, did not take place until the afternoon. After a musical prelude and my welcoming address to the numerous guests, Minister Stratmann made the first short greeting speech. After several more greetings from the Vice President of Clausthal University of Technology, Prof. Beck, and from the Mayor of Clausthal, Prof. Dietz, I received, on behalf of CUTEC, an award from the initiative "Germany – Land of Ideas", whose representative, Mr Eggert from Deutsche Bank, presented it to me. After the music performance that ended the ceremony there was one last tour of the premises for the minister and a group of interested guests. At each of several selected stations, one

Experts in dialogue: The specialists were satisfied as well

Continued on page 2

IN THIS ISSUE

Continuation from page 1

Land of Ideas

Danny "enchanted" our guests

highlight of CUTEC research was presented to them. These highlights included the ArtFuel plant, for which we had received the award on that day, the fuel cell test

The tours offered an insight into the scientific work

During the tour of CUTEC, Prof. Carlowitz (r.) explained the functions of the various plants to Minister Stratmann and interested guests

stand as a joint project in Lower Saxony, and the FlocFormer, which will be marketed by "Aquen", the first company that has originated out of CUTEC.

Finally, I would like to express my thanks, of course, to all the members of staff at CUTEC for their dedicated effort before and during the day, without which it would have been impossible to organize and hold such an event, and to our guests for their visit. I hope that they spent instructive as well as pleasant hours with us.

Yours,
Otto Carlowitz

CUTEC is present at home and abroad:

Week of the Environment in Berlin, City of Science in Braunschweig and the WasteTech trade fair in Moscow

Week of the Environment

When the Federal President Horst Köhler, together with the German Federal Environment Foundation, opened the Week of the Environment in the park of Bellevue Palace on 5th June 2007, CUTEC was represented there for the third time.

The Week of the Environment was opened by the Federal President Horst Köhler

This year, the project BioFros was presented to about 12,000 guests. The aim of the project is to increase biogas production in fermentation plants, which is especially necessary with regard to the need to save resources and to the scarcity of primary energy sources. In most cases, the technical limit of 60 % biomass turnover is not reached by means of conventional technology, which is why CUTEC technology and experience in the field of sewage sludge is now being transferred to the field of biomass.

There were a lot of interesting technical discussions during the event

In Berlin, CUTEC was in good company. The 180 invited exhibitors rank among the most important representatives of German environmental technology and research. Apart from ecofriendly production techniques and products, issues of water pollution control and climate protection, material circulation and mobility were the focus of interest. (schä)

City of Science

From 14th to 17th June, CUTEC presented itself on Castle Square in Braunschweig at the event "Wissen findet Stadt" (knowledge meets the city). Posters and the model of the ArtFuel plant, as well as an abundance of sunflowers and rapeseed plants, were attractive eye-catchers. In addition, the smell of fresh popcorn helped to lure many young visitors, but also adults, to the stand. In a quiz, the children could win chemistry sets and fantastic

Continued on page 6

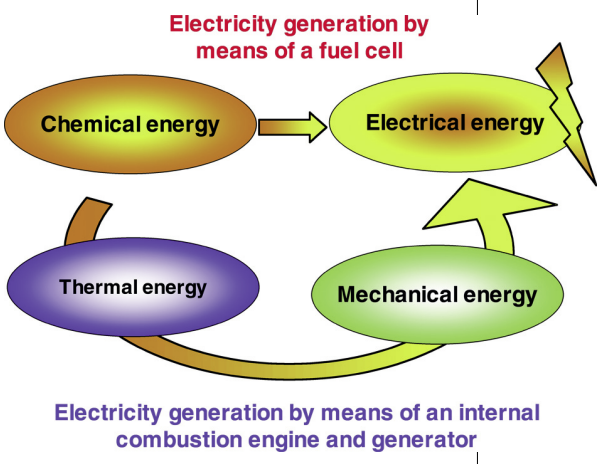
Plant power, popcorn and cool prizes: This "mixture" fascinated many "scientists", be they young or young at heart

SOFC fuel cell systems with anode off-gas recirculation or: How to make good things better!

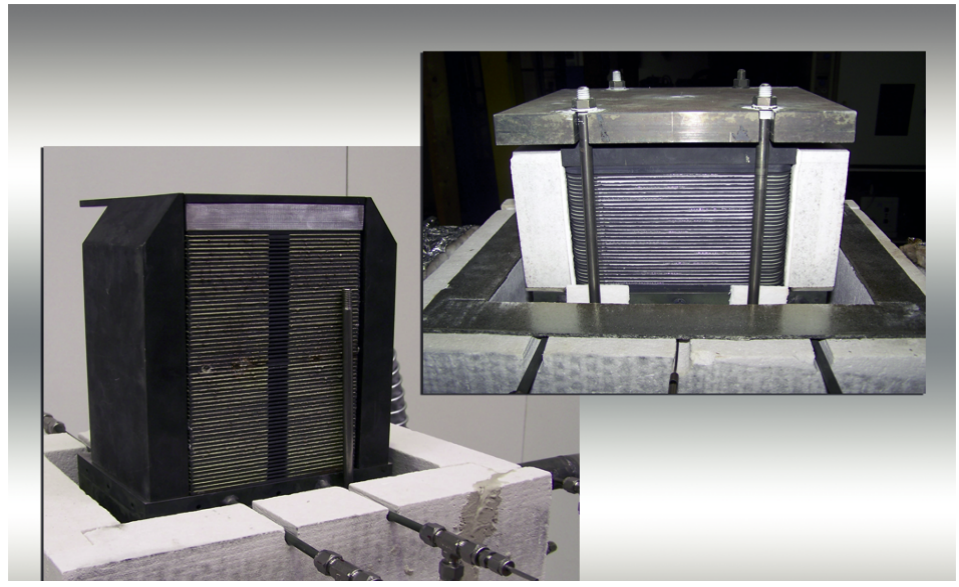
Fuel cells are regarded as a promising approach to generating electricity. In ordinary internal combustion engines, the chemically bound energy of the fuel is first transformed into heat. By means of a generator, electricity is produced indirectly via mechanical energy. Each of these conversion steps involves losses, so that only a part of the initially supplied energy is finally utilized in the form of electricity. Fuel cells, in contrast, convert the fuel's chemically bound energy into electricity directly via electrochemical reactions, which allows higher degrees of efficiency to be achieved.

Since April 2007, the CUTEC Department of Chemical Processes has worked on a fuel cell project supported by the Federal Ministry of Economics and Technology. The aim is to improve the efficiency of fuel cell systems further, true to the motto: Make good things better! In this respect, CUTEC receives help from the Institute of Electrical Power Engineering of Clausthal University of Technology. Further partners are the Institute for Heat and Fuel Technology of the Technical University of Braunschweig and the Center for Fuel Cell Technology in Duisburg. Leading protagonists from the field of industrial fuel cell development are also involved in the committee that is accompanying the project. For example, the companies Siemens, Staxera, Umicore and FuelCon are represented.

The basic idea of the project seems to be simple: If a fuel cell is to be operated on available fuels such as propane, a gas first has to be generated from which the fuel cell can generate electricity. In the present case, an SOFC fuel cell is used, which is capable of utilizing either hydrogen or carbon monoxide at temperatures of 850 °C.



Different methods of electricity generation



SOFC high temperature fuel cells

The generation of these gases takes place in a reformer, in which air and propane gas are first converted into synthesis gas (hydrogen and carbon monoxide). In the fuel cell, electrical power is produced from this gas. The anode off-gas leaving the fuel cell contains not only residues of hydrogen and carbon monoxide, but also water and carbon dioxide, the reaction products generated in the cell. If a part of this off-gas stream is resupplied to the reformer, these gases can also be used for propane reformation instead of air. This allows the fuel gas yield to be increased in comparison with a reformation process that uses pure air. Thus the fuel cell can obtain more electrical energy from the same amount of propane gas.

As usual, the difficulties of this principle lie in the details. For instance, an injector needs to be developed that refeeds the fuel cell off-gas to the reformer at temperatures of up to 900 °C. Another major field of activity is the development of a reformer that makes the different modes of operation possible and is capable of efficiently converting gases of variable composition. Once these component parts have been completed by the respective project partners, they are assembled into the overall system and tested in combination. The works are complemented by simulation calculations and drafts of control strategies that allow the system to be analyzed and optimal modes of operation to be determined.

It is the aim of the project to show that a system operated in such a way allows higher degrees of efficiency to be achieved. Previous calculations have shown that a significant increase in efficiency results from the concept outlined above. If this can be realized in practice, yet another step towards the market introduction of fuel cell systems will have been made – because good is sometimes still not good enough...! (li)

1st Call

for the 5th conference on Advanced Oxidation Processes (AOP)

On 27th September, the "1st Call" for the fifth international conference on Advanced Oxidation Processes (AOP) was presented to the public.

By request of many participants, the conference will take place in Berlin from 30th March to 1st April 2009 and will be the first joint specialist conference of the International Water Association (IWA) and the International Ozone Association (IOA). Apart from the experienced organization team consisting of CUTEC (with the Department of Physical and Biological Processes being in charge) and Berlin University of Technology (Germany), the European Group of the IOA (France) and the trade fair organizer Wasser Berlin (Germany) could be won over.

Additional information as well as the conference call can be retrieved at www.cutec.de/aop5 or aop5@cutec.de. (schä)

Detectino

Detecting the cable and pipeline labyrinth below the asphalt

Labyrinth of pipelines underneath a road

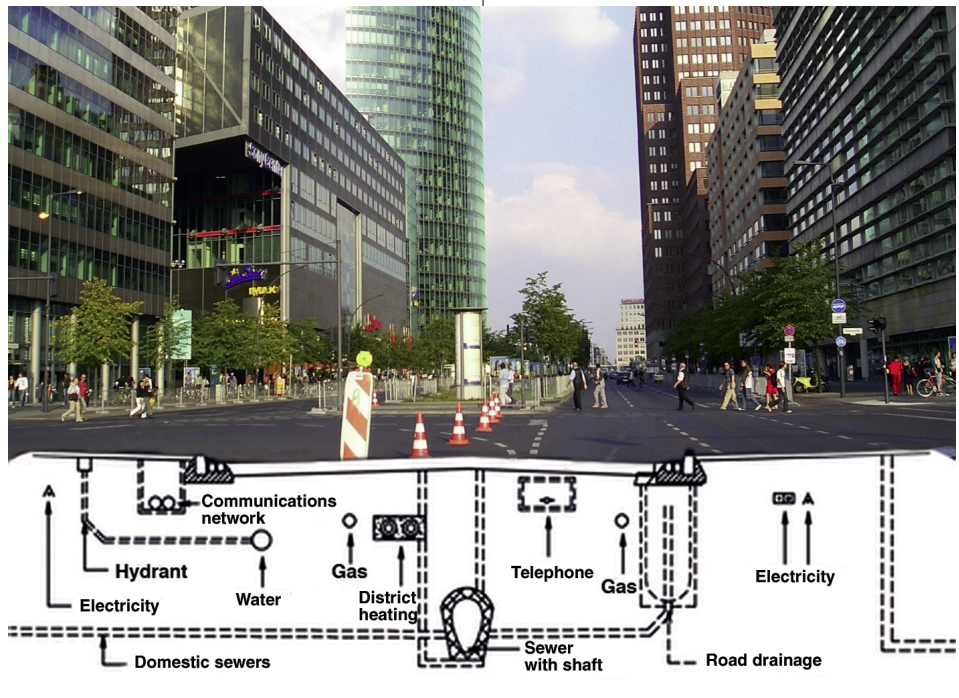
It is a well-known picture: In search of faulty cables or pipelines, road workers dig up entire streets until they finally find the weak points. The cause of all the trouble, on public as well as on private land, is the insufficient documentation of the underground cable and pipe systems, which have been expanded continuously during the last few decades, parallel to the growth of the towns and cities. The economic losses arising during the construction and modernization of these systems amount to around 210 million annually in Germany alone.

Detectino® was initiated by the building contractor Infrastrukturbau GmbH as an R&D project and is supported, in addition to industrial partners, by the state of Lower Saxony. Before the first hole can be dug at a construction site, the contractor always has to investigate the location of cables and pipes owned by third parties: If they are damaged, the contractor is liable. This is relevant for the insurance company Vereinigte Hannoversche Versicherung A.G., which is participating in the project. In some cases, enquiries have to be sent to a dozen utility companies. And even then, the civil engineers do not know for sure what they will find in the ground. Often, old drains and sewers are only vaguely recorded on the plans. Maintenance of this infrastructure requires millions, and wherever the pipes are too narrow, the inspection is done by means of a remote-controlled camera rover. A specialist in this field is the company ProKasro Mechatronik GmbH. There is no such thing as a general map of the subsurface world. Some operators provide maps of the digging area, but others give only vague written indications. Therefore, there is great interest in a localization system that screens the ground using geophysical methods, much like an X-ray eye, and reveals the course of cables, pipes and drains.

The particular advantages of the device: It is intended not only to detect the locations of the cables and pipes, but also their materials, such as plastic, metal and ceramic – irrespective of their depth and diameter, the soil conditions and the current soil humidity on-site. Detectino® is a multidisciplinary project and derives its "visionary" capabilities from the information technology developed by CUTEC and the sensory methods realized jointly by the GGA Institute (Institut für Geowissenschaftliche Gemeinschaftsaufgaben, Leibniz Institute for Applied Geosciences, Hannover) and the University of Frankfurt. Apart from these institutions, ESRI (Environmental Systems Research Institute – a software producer of Geographical Information Systems (GIS)) and the trade association of the construction industry are involved. CUTEC is responsible for the fields of software development, intelligent processing of the measured data and visualization of the new cable and pipe maps.

At present, there is no central register of all the supply networks. Most grid operators in the supply and communications sectors provide the data about their infrastructure only confidentially. A complete overview of all the pipe and cable systems has to be created from scratch again and again. Detectino® is intended to help close this gap. It is intended to bring information from different sources together via the internet and superimpose it on the site manager's screen in order to form a more or less precise pipe and cable plan that can be checked on-site. Therefore, there is hope that a new transparency can be brought about by means of this innovation, and also that it will allow most cases of excavation damage to be avoided in future.

(gö/fr)



The present view into the ground will later be visualized in virtual reality on the computer

CUTEC starts running the "DeSiFloc" plant in Hattorf

Research and demonstration plant for the treatment of landfill leachate

In cooperation with CUTEC, the district of Osterode am Harz has operated a pilot plant for the treatment of landfill leachate on the district's landfill site in Hattorf since

Installation of an inclined plate lamella clarifier into the final sedimentation tank

1999. Due to the positive results, the district of Osterode, together with CUTEC, started the construction of a research and demonstration plant for landfill leachate treatment in early March of this year. CUTEC has been responsible for the entire process engineering equipment and for process control. At present, the plant is being put into operation.

The design of the research plant "DeSiFloc" for landfill leachate treatment, developed by CUTEC, comprises a new, patented technique that allows contaminants to be removed much more efficiently in comparison with conventional methods. The new technique is applied downstream of the biological pre-treatment. Those contaminants that are not – or cannot be – decomposed biologically are specifically precipitated by the CUTEC method "FlocFormer" and can largely be filtered out of the waste water flow by means of a simple sieve method. The running costs of the new technique are very low. Electricity consumption, for example, amounts to only around 15 % of that of the conventional separation process. The final (and expensive) activated charcoal treatment serves only a protective function for the outgoing water. In this way, the costs for activated charcoal can be decreased by about 80 %.

The utilization of the FlocFormer allows process control of landfill leachate treatment to be carried out more coherently in terms of process engineering and cost efficiency, compared to the conventional treatment method. For the overall system, the objective is to remove all the contaminants from the waste water cost-effectively by means of the FlocFormer technique, except for the nitrogen components, which will continue to be degraded biologically. In addition, the plant can be adapted more flexibly to changing conditions, such as varying pollutant concentrations or volume flow rates.

View of a part of the chemo-physical treatment stage

Chemical storage room of the DeSiFloc

Beyond that, a pilot-plant hall in the new operations building has been assigned to CUTEC for further research. By means of this close contact between science and its application, an interesting and efficient partnership is guaranteed. The close proximity ensures quick responses and constant consultation.

(schr)

IMPRINT

Publisher: CUTEC-Institut GmbH
Edithor: Dr. T. Heere
Authors:
Prof. Dr.-Ing. O. Carlowitz (ca)
Dr. T. Heere (he)
Dipl.-Inf. R. Fritzsche (fr)
Dipl.-Wirt.-Inf. J. Görmer (gö)
Dipl-Ing. C. Immisch (im)
Dr.-Ing. A. Lindermeir (li)
Dr.-Ing. T. Onyeche (on)
Dipl.-Ing. S. Schäfer (schä)
Dr.-Ing. C. Schröder (schr)
W. Weber-Kubitzki, B.A. (wb)
Layout and setting: G. Wessels (wes)
Photos: Gert-E. Knochen (kn)
Production and supply:
CUTEC-Institut GmbH
Leibnizstr. 21+23
38678 Clausthal-Zellerfeld
Phone +49 5323 933-0
Fax +49 5323 933-100
E-Mail: cutec@cutec.de
Internet: www.cutec.de
Publication:
Several issues per year in irregular order.
The issues can be ordered at the a.m. supply address.

New members of the Scientific Advisory Board of CUTEC:

Dr.-Ing. Rolf G. Mayer in profile

Dr.-Ing. Rolf G. Mayer

The rotational change in composition of the Scientific Advisory Board has taken place again this summer. In this and the coming issues of CUTEC News, we will present the new members to you. The complete list of all the members can be found on our home page at http://www.cutec.de/Wissenschaftlicher Beirat.

Since the year 2000, Dr.-Ing. Rolf G. Mayer has been the Director of the Braunschweigische Maschinenbauanstalt AG (BMA), which was founded in Braunschweig as early as 1853 and today delivers machines and equipment worldwide for the processing of renewable resources on an industrial scale, especially for the sugar industry. Since 2003, he has also been the Director and sole shareholder of the BMA Verwaltungs GmbH, which is the majority shareholder of BMA AG. Dr.-Ing. Mayer started his academic career studying electrical engineering at Braunschweig University of Technology and received his diploma degree in this subject in 1979. Subsequently, he worked as a scientific employee at the Institute for Electrical Machines, Traction and Drives of the Technical University of Braunschweig and received his degree as Dr.-Ing. there in 1986 with a thesis on permanent magnet excited axial-field synchronous machines with high torque. In the same year, he started working as head of the departments Electrical/ Hydraulic/Pneumatic Systems and Product Development at the Salzgitter Maschinenbau GmbH (SMAG), where he performed various management functions until 1994. After moving to Berliner Elektro Holding AG (BEH), Dr.-Ing. Mayer at first worked as a project leader and later as an authorized representative and as the General Manager of various companies within the holding company, before returning to Braunschweig in 2000 to assume his present position. His contact to CUTEC was established by meetings at regional events. In the course of time, the contact was deepened by an intensive exchange of ideas with Prof. Carlowitz and other members of the CUTEC staff, and it finally resulted in the request to join the Scientific Advisory Board of CUTEC. When asked for his view of the future goals for CUTEC, Dr.-Ing. Mayer replied that he had got to know CUTEC as a creative, productive and powerful development company. CUTEC seemed to him to be equally strong in the basic scientific approach and in the practical transfer of its developments into applications. CUTEC would not shy away from practical experiments and from the operational effort associated with them. His conclusion: "CUTEC has succeeded in securing a solid position in the development arena. It is necessary to continue this with current and future innovations in the company's fields of business." In the market segment of the industrial utilization of agricultural resources, which is growing worldwide, Dr.-Ing. Mayer thinks that CUTEC could make a considerable contribution to the international position of the existing industry in Lower Saxony, a contribution that might even increase in future. As a new member of the Scientific Advisory Board, he wants to help the Institute achieve the described goals by contributing two assets: The international experience his company has built up in many years of continued business operations on four continents and in about 80 countries around the world, and the contacts to a wide variety of potential future project partners who are part of the networks BMA has established in the region and beyond. (he)

DATES

- CUTEC presentation at CeBIT 2008
  from 4th to 9th March 2008
  in Hannover
- CUTEC presentation at IFAT 2008
  15th International Exposition for Water, Waste Water, Solid Waste, Recycling
  from 5th to 9th May 2008
  in München

Continuation from page 2

CUTEC is present at home and abroad

books as prizes. The visitors were most interested. Many conversations lasted well over a quarter of an hour. Some of the curious stand visitors even reappeared at the CUTEC open day. However, what particularly sticks in one's mind is the reply given by an eight-year-old boy: "No, thank you, I don't want any popcorn, I would rather have a look at the posters first". (im)

WasteTech

From 29th May to 1st June 2007 CUTEC exhibited at the international trade fair WasteTech and congress in Moscow, Russia. The institute was represented by Dr. Theodore Onyeche, Manager, International Operations and his assistant Mrs Wendy Weber-Kubitzki.

This fair for waste management, recycling and environmental technologies reflects development tendencies of this sector in Russia. It became obvious that the idea of waste management is also of increasing importance there. The trade visitors were very interested in the unique and sustainable environmental engineering processes showcased by CUTEC. Some of them even promised to visit CUTEC institute next year to intensify contacts and identify possible areas of cooperation. Dr. Onyeche's platform presentation "Low-pressure sludge homogenization for increased energy production with improved economic benefits at wastewater treatment plants" also received great attention.

Participation in this fair made it possible to gain an overview of the environmental situation in Russia and to introduce CUTEC's technologies to the Russian market. (on/wb)

Minister-President Christian Wulff invites delegation from Tokushima to Lower Saxony

The delegation from Tokushima with Minister-President Wulff in Hanover

Upon invitation by Mr Christian Wulff, Minister-President of the German Federal State of Lower Saxony, a delegation from Tokushima Prefecture, Japan visited Lower Saxony from 13th to 16th September 2007. At the official welcome at the State Chancellery in Hanover, Mr Kamon Iizumi, Governeur of Tokushima Prefecture, and Minister-President Wulff signed a cooperation agreement which aims at intensifying future contacts between Lower Saxony and Tokushima. Dr. Onyeche, CUTEC's Manager International Operations, also participated in this event.

On 14th September the delegation, which comprised of high-ranking political, research, educational and cultural representatives, visited CUTEC institute. The group was accompanied by Mr Hirschfeld and Ms Völksen from the State Chancellery as well as Mr Regelsberger, interpreter. After the welcoming speech by Prof. Carlowitz, Managing Director of CUTEC, Dr. Onyeche highlighted CUTEC's potential in the field of environmental services. Subsequently Prof. Carlowitz made a presentation on "Fuels, combustibles and chemical feedstock from biomass conversion: Research & Development at CUTEC". The great interest in the CUTEC technologies and processes described by Prof. Carlowitz and Dr. Onyeche was reflected by the competent questions of the visitors. The group was then taken on a tour of CUTEC facility and its pilot plants to show them some ongoing projects. Following a business lunch, the delegation from Tokushima headed off to visit the old town of Goslar. (on/wb)

The visitors from Tokushima at CUTEC

Cooperation between the local government of Dongguan, China and CUTEC

In late July 2007 Dr. Theodore Onyeche, CUTEC's Manager International Operations, and Engr. Michael Struve, expert for solid waste management and landfill development, flew to China to introduce CUTEC technologies for solid waste management and soil remediation to the local government in Dongguan. This visit was organized by Mr Lei and Mr Tao from Jointeco Enviro-Energy Tech. Co., Ltd., CUTEC's contact partner in China. During the trip, Dr. Onyeche and Engr. Struve met with the Mayor of Dongguan, Mr Liang, and with Mrs Wang, President of Dongguan WeiMan Environment Technology Co., Ltd. The CUTEC team visited several landfills in Dongguan and discussed different solutions for treatment of solid waste.

Engr. Struve, Prof. Carlowitz, Prof. Dietz and Dr. Onyeche with the delegation from Dongguan in front of CUTEC

In September 2007 a 24-member delegation from Dongguan, led by Mr Chong Bi Zhai, Secretary of the Communist Party, Committee of Shipai Down (Dongguan, China), paid a two-day return visit. On the first day the group visited a wastewater treatment plant with biogas plant in Wolfsburg to familiarize them with the environmental technologies used in Germany. On the second day the delegation was welcomed at CUTEC-institute by Prof. Otto Carlowitz, Managing Director of CUTEC, and Prof. Peter Dietz, Mayor of the city of Clausthal-Zellerfeld where CUTEC is located. In 1990 Prof. Dietz had supervised the Ph.D. work of Dr.-Ing. Wan Gang, Chinese Minister of the Ministry of Science and Technology, who graduated from the Clausthal Technical University in Germany with a Ph.D degree in Mechanical Engineering. A lecture held by Engr. Struve highlighted important aspects of solid waste management and soil remediation vital for the city of Dongguan. During the visit special areas of cooperation were identified and a sustainable concept for treatment of solid waste in Dongguan was discussed. (on/wb)

New in the CUTEC team

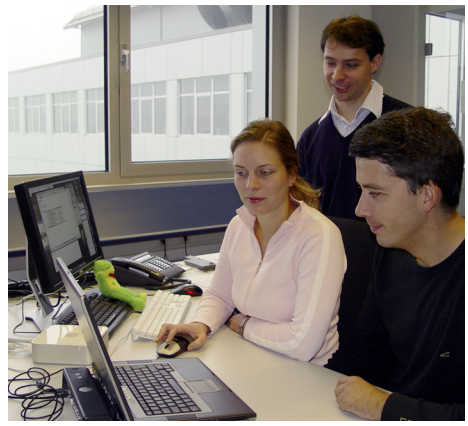
On 1st January 2007, Dip.-Ing. Lukasz Piech took up his post at CUTEC.

Mr Piech graduated from Wroclaw University of Technology in Poland with a Diploma degree in mechanical engineering. In 2004, he came to Clausthal University of Technology, where he completed his postgraduate studies in process engineering and also obtained a diploma degree. Already during his studies in Clausthal, he worked for our institute as a scientific assistant and is thus well-known to many CUTEC colleagues.

Enthusiastic and vigorous in their new spheres of activity: Daniel Kajstura (l.) and Dipl.-Ing. Lukasz Piech (r.)

In future, Dipl.-Ing. Piech will work in the Department of Thermal Processes and will support the successful projects here.

Also on 1st January 2007, Mr Daniel Kajstura started work as a technician in the Department of Thermal Processes. Mr Kajstura is responsible for pilot plant maintenance and operation. Previously, he had also gained several years of experience in the mechanical workshop gained the excellent support of Mr Lutz Gründler, who works here as a metalworker.



The Detectino team: Dipl.-Wirt.-Inf. Jana Görmer, Dipl.-Inf. René Fritzsche and Dipl.-Inf. Alexander Landa (from l.)

There is hardly any step that is as important for young people as the start into professional life. On 1st August 2007, five young people entered the professional "real world" at CUTEC.

For Sabrina Uhlig, that Wednesday was her first working day in the administration. Over the next two years she will receive a sound training as an office administrator here.

Filing, turning, drilling and milling, these are the first manual skills Mr Sören Fischer has to learn. Beyond that, he will learn a far greater spectrum of skills and knowledge in the coming years of his training as an industrial mechanic in the mechanical workshop at CUTEC.

The team has also grown in our electrical workshop. Mr Carsten Müller started his training as an electronic technician for industrial engineering. In future, interesting and challenging tasks are in store for him involving electrical systems and electronics as well as measurement and control technology.

This year too, CUTEC has offered two pupils the opportunity to do a one-year internship in our institute.

Mr Cedric Lindner, who attends the vocational business school, is receiving his practical training in the administration, while Mr Daniel Gröters can acquire the practical skills for the vocational technical school in the mechanical workshop at CUTEC. (he/wes)

Youth meets experience: Sören Fischer, Carsten Müller, Lutz Gründler, Cedric Lindner and Sabrina Uhlig (from l.)

We congratulate…

Office administrator Britta Kahla

…Ms Britta Kahla. As a trainee in the commercial sector of CUTEC, she has successfully passed her exam as an office administrator after only two years. Now she attends the vocational business school, aiming at the advanced technical college entrance qualification.

We would like to thank her again and wish her all the best for the future. (he/wes)